DOCUMENT RESUME

ED 098 378 CE 002 467

AUTHOR	Lauda, Donald P., Ed.
TITLE	Environmental Education: Role of Industrial Arts Education.
INSTITUTION	American Industrial Arts Association, Washington, D.C.
PUB DATE	73
NOTE	39p.
AVAILABLE FROM	Executive Secretary, American Industrial Arts Association, 1201 16th Street, N.W., Washington, D.C. 20036 (No price given)
EDRS PRICE	MF-$0.75 HC Not Available from EDRS. PLUS POSTAGE
DESCRIPTORS	Careers; *Ecology; Educational Needs; *Environmental Education; Federal Aid; Financial Support; *Industrial Arts; *Industrial Technology; Interdisciplinary Approach; Resource Materials; Teacher Role; Values; *Vocational Education Teachers
IDENTIFIERS	Environmental Awareness

ABSTRACT

The curriculum committee of the American Industrial Arts Association, recognizing the necessity for the involvement of industrial arts teachers in environmental awareness, prepared the publication to assist teachers in such topics as: rationale for study, careers, [illegible]ng, and resource materials. An introductory article comments on environmental stewardship, the responsibilities of technology, and environmental education. The article on "Perspective" briefly reviews our technology, gives attention to viewing the environmental question as a total ecosystem with interrelated components and variables, and examines the role of industrial educators in changing values and environmental concern. The author of "A Rationale for Integrating Industrial Arts and Environmental Education" views industrial arts teachers as having a unique opportunity to integrate environmental sensitivity into technology since technology will play a key role in solving pressing environmental problems. Another article focusing on "Rationale for Studying the Environment in Industrial Arts" conveys the concept of environmental education as an interdisciplinary, multidisciplinary approach with industrial arts dealing with the technological dimensions of environmental education. The concluding article reviews funding appropriated by the Environmental Education Act of 1970. Environmental careers are briefly surveyed, and a bibliography of environmental books is included. (EA)

ED 098378

ENVIRONMENTAL EDUCATION

ROLE OF INDUSTRIAL ARTS EDUCATION

prepared by
Environmental Education Committee
American Industrial Arts Association
1973

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

"PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL BY MICROFICHE ONLY HAS BEEN GRANTED BY
NEA
TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER."

edited by
Donald P. Lauda
Indiana State University

CE 002 467

Orders for and requests about this monograph should be addressed to the Executive-Secretary, American Industrial Arts Association, 1201 Sixteenth St., N.W., Washington, D. C. 20036.

Copyright © 1973 by the American Industrial Arts Association,
1201 16th St., N.W., Washington, D.C. 20036.

THE COVER

Designed by
Ray Douglas Loyd

The cover was designed to illustrate the regenerative process of education. The pod of knowledge, flourishing upon the nutrients of human concern, has opened to allow its seeds of endeavor to go forth in union and produce more knowledge. Assuming traits from both parent seeds, industrial arts and environmental education, this knowledge will continue to grow. If properly cared for, it will insure the future of mankind.

COVER DESIGN DONE BY:

Dr. Ray D. Loyd, Assistant Professor,
Department of Industrial Arts and
Technology at California State
University, Fresno.

TABLE OF CONTENTS

PREFACE	v	Donald P. Lauda
INTRODUCTION	vi	William D. Ruckelshaus
CHAPTER 1		
Perspective	1	Iver H. Johnson
CHAPTER 2		
Introspective		
A Rationale for Integrating Industrial Arts and Environmental Education	13	Ray D. Loyd
Rationale for Studying the Environment in Industrial Arts	19	Arthur Figurski
Funding and Careers	22	C. E. Strandberg
BIBLIOGRAPHY	25	Iver H. Johnson

PREFACE

In 1971 the Curriculum Committee of the American Industrial Arts Association addressed itself to the topic of environmental education. In the fall an ad hoc committee was appointed to investigate the association's role in environmental education. The three man committee immediately recognized the necessity for the involvement of industrial arts teachers in environmental awareness. The report submitted to the Executive Committee in the spring expressed a need for education at all levels, including that for teacher educators; the necessity for federal funding of pilot programs; more publications in our journals, as well as speakers at state and national meetings.

As a result of this preliminary effort, the committee was retained with a broadened membership including representatives from all seven regions of the United States. The committee now has ten members representing both the secondary level and the teacher education level. The committee is now a permanent part of the Elementary Education section of the AIAA.

The committee recognized early in its history that teachers in the field do not have materials for their classes. In order to assist these teachers an outline was prepared for a monograph which would include such topics as: rationale for study, careers, funding, and resource materials. This publication represents the results of this effort. All committee members have worked on this publication and look forward to continuing their efforts with your support.

The contributions of Daniel Householder and C.E. Strandberg deserve special mention at this point. They worked with the chairman when the committee was first formed including several trips for meetings and have assisted in the final compilation evident in this monograph. Special recognition is also warranted for Ray D. Loyd who designed the cover of this publication. Its quality and professional appearance speaks for itself.

The future of this committee and the AIAA's role in environmental education relies upon a concerted effort on the part of all members of the association. We look forward to your input and support.

Donald P. Lauda
Chairman

INTRODUCTION

BY
William D. Ruckelshaus*
Administrator
Environmental Protection Agency

The most characteristic activity of 20th century man has been his relentless drive to master the natural world. We have begun the conquest of time and space; we have provided unprecedented comforts and stabilized our food supply. We have extended life spans and opened up opportunity for millions, and we can even see the dawn of genetic and behavioral engineering in the distance.

However, in the process we have fouled the air, the water and the earth, and discovered that even the oceans are not too big to be contaminated.

Certainly our great technological and material advances have not been unmixed blessings. In our zeal for development we lost track of the kind of society we set out to be. For example, the automobile gives us unmatched personal mobility but some 56,000 of us die in traffic accidents every year. Jet airliners whisk us between cities faster than we can get to and from the airports at either end of the journey. Television reaches into nearly every home yet its great potential for enriching our lives is barely tapped.

Yet, today, there is a strong—and I believe irresistible—movement in this country toward quality of life and away from a preoccupation with quantity, material success, wealth, and power.

I think this nation is well on its way to a new era of environmental stewardship. We are beginning to realize that the earth itself, the whole biosphere, is an environment from which we cannot insulate ourselves. If we alter that environment, we must also protect it and correct the abuses of the past. We must learn to foresee the full effects of our actions on the world of the future, so that human beings and the whole panoply of natural resources stay in balance.

The prime goal of modern society has been knowledge because knowledge meant progress. But with knowledge must come responsibility.

Applied science is changing from a period of extraordinary and unquestioned growth and innovation to a time of caution. Until recently, it seemed there was nothing we could not do. Now, we are repeatedly and most cogently reminded that we depend on living processes for survival—processes we only dimly understand and cannot control or supplant.

The conclusion is inescapable that from now on our applications of technology will be monitored, subjected to critical review, and modified in advance to meet social requirements. This does not mean we should discontinue or slow the development of new technology, rather that we need to

*Mr. Ruckelshaus prepared this introduction just prior to leaving the Environmental Protection Agency.

understand better the human and environmental impact of its ultimate use. In the long run, this will be less expensive than having to undo our mistakes after the fact.

Too long in the past most technologists were euphoric about the future of man—technological development was the master and received total dedication. Technology, today, must be responsive to societal goals and values.

Rene Dubos has told us that "knowledge of consequences is an essential part of good technology." He said: "To a large extent, the ecologic crisis results from the fact that modern societies have not yet appreciated the need for exhaustive scientific studies of the long range consequences of social and technological innovations."

With science integrated into the total culture of mankind, I have no fear for the future. But first this must be accomplished.

Of particular concern today is the relationship of the science student—in fact of all students of all ages—to the enormous problems of environmental control, or how to restore the balance between man and nature. The generations of the future must understand the environmental impact of man's actions more clearly than preceding generations if man is to survive, prosper, and advance in wisdom as a guardian of the Earth.

What is required is greater understanding of how the natural world works and how man is changing it.

True environmental education does not merely comprise an understanding of conservation and conservation practices, or anti-pollution measures. It seeks to promote an understanding by man that he is part of a system composed of people, culture, and his physical and natural surroundings. It seeks to promote the knowledge that man has the ability to control, preserve, and destroy the environment.

In our colleges and universities, environmental education must mesh with standard courses which help establish the social, political and economic values of American society.

It is extremely important, as well, that we deliver the environmental message down the line to secondary and elementary school students, and even to pre-school children.

This new emphasis on environmental education will, of course, require the direction of fresh thinking and energies to development of new curriculums and teacher training programs.

To stimulate interest in the natural world and hopefully environmental education, the President, in October 1971, established a merit awards program to recognize environmental services by American youth. The program has been steadily expanded by the Environmental Protection Agency and now includes all grades in elementary and secondary schools as well as summer camps and youth organizations. In January, 1973, the program was organized in 3,863 schools, plus many youth organizations, which represented a total of 3,017,919 young people.

We must always keep in mind that the people of this country are our greatest natural resource. The people will determine finally whether we continue along the path to environmental sanity. And the students of today will determine the progress we make tomorrow. In a short time, they will shape

and control the politics, economy, diplomacy, and quality of life in America. This clearly tells us why we must give new strength and direction to environmental education.

Restoring the vitality and beauty of the earth is not a one-man job, a one-generation job, a one-agency job, or even a one-country job. All of us are needed—particularly American youth—because we have a good thirty years of hard work ahead of us.

Fortunately, our fundamental values are changing, and we are beginning to realize that it is time to settle our environmental accounts. The average American is beginning to see that the good life is not just a matter of fast cars, fashionable clothes, household appliances, and plenty of pocket money. High standards of living mean nothing if we are surrounded by ugliness and hazards to our health and if the natural systems and resources upon which we depend are endangered.

If we want reform—if we refuse to gamble the future for the present—we must assume for ourselves—now and in the future—viable roles in policy making, program formulation, and service to the nation. Environmental education will help shape these roles in the years ahead.

America led the world in establishing high standards of living and in making democracy work. We now have a greater destiny: to lead mankind into an "Age of Amenity" where civilizations are judged by their esthetic, social, and spiritual values, not by how much they consume and throw away. We can, if we will, assure for all citizens the life, liberty and happiness which is rightfully theirs.

CHAPTER 1

PERSPECTIVE

by
Iver H. Johnson
Mankato State College

The Meaning of Ecology

"Man is a beggar upon the face of the earth: he can contribute nothing but waste products, . . ." (Fabun, 1971, p. 20).

The above statement, taken from the *Dimensions of Change*, in or out of context, must be considered a rather stern advisement that man through time risks fouling his nest beyond repair. As population and the non-degradable products of our recent technological triumphs persistently surround us in ever greater abundance, it is perhaps time to review the circumstances and rather critically evaluate, not only what we have, but the legacy we in turn will provide our youth as an inheritance reflecting our ultimate wisdom. With this in mind an investigation of the system which produced this affluence seems in order. Consequently, a look at the word ecology (the study of organisms in relation to their environment) seems an appropriate route to take.

Many variables must be considered as the question is engaged. Some of these appear to include man, his society, his level of technology and the total environment (earth) where these factors interface.

First a look at man and his nature seems appropriate. Consider the following.

> "Once upon a time there evolved upon this planet an organism that was ill-suited for survival. It could not run fast enough to escape its enemies; if caught, its teeth and claws were small protection. It was too big to hide under a leaf and too weak to burrow deeply into the ground. To survive, it took refuge in caves where a fire at the entrance kept predators at bay. If the fire ran out of fuel, this creature could hurl rocks and thus drive all but the most determined enemies away. Its security was measured by the amount of firewood it could accumulate and the number of rocks it could gather and store in the cave against the terrors of the night.
>
> Now, you see, this was a very important sort of thing. All other creatures grew bigger teeth, or learned to run faster. Alone among all the creatures on earth, the one we are describing turned to things for its survival. This was, in the end, to make all the difference.
>
> After a while, this creature learned to cultivate some edible plants to supplement the food it could get by gathering and hunting. Growing food was, at best, uncertain and in any event depended on the seasons, which could not be controlled. The creature began to store its surplus foods. His security against the vagaries of nature was measured by how much he could grow and how much he could store.
>
> His feeling for being at least partly in control of his destiny was based on the gathering of things. Well-being was measured quantitatively—the

more the better. From the very beginning, he was motivated by fear—fear of pain, fear of death, fear that there wouldn't be enough.

In time, this creature's activities produced so much that it became more convenient to represent the accumulation of things by other things, smaller and easier to carry or to exchange. These symbols—although intrinsically of no value—assumed the same value as things. And men—or at least most men—became engaged in the acquisition and accumulation of the symbols of things. They did this even when they no longer had any need for them. The symbols were the surrogates for the rocks piled in the cave against the coming of the night.

Think of this sytem as being reinforced, over and over, through hundreds of generations and thousands of years, through social approval, ritualization and acculturation. That there was something basically wrong with this way of life may be exemplified by the fact that those who refused to subscribe to the accumulation and storage of things (Christ, Mohammed, Buddha) became the founders of the world's great religions.

Throughout all of this, nature was the 'enemy'. The purpose of the life of this strange creature we have described was to 'conquer' nature, 'tame' the wilderness, 'make war' on pests and vermin, 'control' the rivers. Life was a 'battle' against the elements; only 'the fittest' survived. Whole species of other life forms: plants, insects, reptiles, fish, amphibians, birds, and mammals were exterminated, most usually because they represented a 'threat' against the accumulation of things; sometimes for 'sport'.

If an individual human being walked into a contemporary psychiatrist's office and exhibited the symptoms just described:

1. Pervasive fear, anxiety and persistent feelings of insecurity. . .
2. Obsession with the accumulation of things or the symbols of things. . .
3. Fear of losing any portion of what already has been accumulated, even though it served no life-supporting purpose. . .
4. Hostility against any living being that threatened to diminish the accumulation, because this meant the reduction of security. . .
5. Deep feelings of depression following each 'success', because the 'success' was not permanent; in a changing world it could be reversed into defeat. And so there followed a greater effort to achieve 'real' success a compulsive and destructive behavior pattern that reinforced itself because every success was, in reality, a failure. . .

If a person exhibiting each behavior were, as suggested, to enter a psychotherapist's office, his general problem would probably be diagnosed as a chronic form of depression, and he might be characterized as an 'obsessive' personality, acting out compulsive patterns that, while intended by him to increase his security, actually serve only to reinforce his fear.

> Had this activity entered the acute phase—expressed in the senseless killing of other living beings and the progressive destruction of his habitat—he probably would be considered 'paranoid' and put away in an institution.
>
> Unfortunately, since the chronic obsessive personality is so widespread throughout mankind, a person exhibiting these symptoms and this behavior would be considered 'normal' and 'sane'." (Fabun, 1971, pp. 4-6)

If the above observations are true, and one might be hard pressed to develop any meaningful rebuttal, then we find man a creature with an insatiable desire for things (many of which he does not need), money, and power. The impact of this sort of mentality from an environmental point of view is raising significant questions in the minds of many of our youth today. Perhaps we as educators can make some meaningful contributions to their multifaceted questions.

Consider now a brief review of our technology. Through history we have seen man as a creature who once feared and desperately fought nature in an often futile effort to survive. Contrast this with the man of today who is in total control of his habitat, or is he? This rise to affluence has as its lineage the introduction of agriculture and man's ability to produce more than he alone could consume. Following this was the industrial revolution complete with the steam engine and its ability to replace man and horses as prime sources of energy. The fact that this bit of technology had a voracious appetite for fossil fuels really didn't make a lot of difference. Following this was the introduction of the now famous (or infamous) internal combustion engine. This magnificent technological achievement provided man with a means to live apart from his work, to enjoy his leisure, to travel, and a place to be alone. The auto is also to receive credit for the million acres that are paved each year, our photochemical smog, and the vast number of deaths that occur each year on our beautiful ribbons of concrete. With our advancing technology we have also been able to allow people to live longer and to cut dramatically our infant mortality rates. With agricultural improvements we need far fewer people on the farm. Consequently, we have far more in the cities and we can now rather safely say that the world's human population is largely urbanized. Because of supply our process industries (manufacturing and extractive) are now found in clusters in close proximity to these supplies. The result was to increase the pollution levels in the given ecologic areas. Fabun defines pollution as "any input into a system that cannot be assimilated and recycled within the system (1971, p. 8)."

Finally Barry Commoner in *The Closing Circle* calls attention to our technological flaws. His position is that since World War II our technological chemistry has provided us with a varied assortment of non-degradable products which can only provide environmental problems. These include the substitution of detergents for soap, non-returnable soda bottles, synthetic fibers, mercury in chlorine production, plastics, high energy consumption in appliances from air conditioners to electric combs, plus an infinite variety of other questionable combinations.

Today our technology has made us more comfortable than any time in history. The affluent American has long ago met his needs and is now contending with his wants. How much is necessary and at what expense (to future generations) is a question worthy of some personal and collective investigation.

Consider our society and the social institutions we have come to cherish, reinforce and protect with dynamic vigor. One can develop rationale to suggest that many, if not all, have as their heritage the technology which prevailed in past generations. Ideas, values, norms appear to change most significantly as a result of technological change. This can be demonstrated by merely reviewing values and norms related to birth control. A fantastic proliferation of laws and legislation have evolved because of the automobile. The economic institution presently prevailing has caused us to believe that individual and collective welfare are closely and positively correlated to the Gross National Product.

Fortunately, a scattered few today are establishing cause to question this relationship and are proposing that we do our evaluation of the circumstances looking at the quality of life rather than the gross national product. The assumption is that our economic and political institutions are designed to reinforce the status quo and that very little significant change will evolve because our modus operandi promotes existing conditions. This position is further promoted by Meadows and others in *The Limits to Growth*. They conclude:

> "While technology can change rapidly, political and social institutions generally change very slowly. Furthermore, they almost never change in anticipation of a social need, but only in response to one." (1972, p. 48)

Without question, our political and social institutions as they presently exist raise significant questions regarding our collective ability to engage environmental questions in any meaningful manner. Firmly entrenched values and norms have rarely been questioned and persist as the American ethic. This way of life, of behaving and acting in conformance with long established norms, is repeatedly reinforced in our schools where we are taught never to question the ethic of work, where our curriculums increasingly direct us to careers, many of which are long gone before the person arrives at a selected goal, where we continue to further specialize in selected curriculum areas with rarely a question to related disciplines. This case is well developed by Ivan Illich in his *Deschooling Society*. Hopefully many will give this work an introspective look.

Man, his technological achievements, his society and related institutions all combine in a world we call our environment. The system is closed and finite. The earth can accommodate only so many people. Our land and seas can produce only so much to sustain our lives. Our natural resources are limited and will not last indefinitely. The earth and its air, land, and water can accommodate a finite amount of waste before the system begins to react in a negative manner with toxic water supplies, poisoned air, and barren, desecrated and non-productive land. Our population could be endangered by war, pestilence, hunger, disease and respiratory fatalities.

These appear to be some of the factors worthy of consideration as one looks at the term ecology. This study of organisms in relationship to their environment requires a commitment on the part of any who concede that something is not quite right. All are related, one directly or indirectly affects the others, often in ways that are not understood until extensive damage has been done.

Because we as educators have accepted a role as interpreters and communicators of technology, it would seem that we are morally bound to investigate, interact with, and engage questions that require interdisciplinary dialogue and action.

The Environment as a System

Man's involvement or interference with the total ecosystem is rather clearly exemplified in a recent publication sponsored by The Club of Rome. The project, initiated in 1968 by a group of thirty individuals from ten countries and including scientists, educators, economists, humanists, industrialists and national and international civil servants, was intended to discuss and identify the present and future predicament of mankind, the underlying assumption being the major problems facing mankind today "are of such complexity and are so interrelated that traditional institutions and policies are no longer able to cope with them, nor even come to grips with their full content." (Meadows, 1972, pp. 9-10)

Phase One of the project was initiated in 1970 and was intended to identify key elements or specific components common to the fundamental problem and to further analyze the behavior and relationships of these components. An international team, headed by Professor Dennis Meadows of Massachusetts Institute of Technology, identified and subjected to computer analysis the five basic factors that determine, and therefore ultimately limit, growth on this planet. These five factors are population, agricultural production, natural resources, industrial production and pollution. The results of the study, which are projective to the year 2100, are reported in *The Limits to Growth* by Meadows and team members.

Of particular significance throughout the report is the attention given to the exponential nature of trends apparent in each of the factors listed. Perhaps a majority of our thought in the past and probably even today has been in linear terms. This fallacy in our problem solving and decision making processes does not permit us to conclude in concurrence with the report. Their conclusions suggest that if present conditions persist in our political, economic, and social systems an overshoot and collapse condition will occur. Capital investment in production will deplete natural resources and raise pollution levels. Population will exceed food supply and the combination of factors will cause the conditions outlined above.

The report calls for an equilibrium state on a global basis. This minimum set of requirements includes:

1. *The capital plant and the population are constant in size.* The birth rate equals the death rate and the capital investment rate equals the depreciation rate.

2. *All input and output rates–births, deaths, investment, and depreciation–are kept to a minimum.*
3. *The levels of capital and population and the ratio of the two are set in accordance with the values of the society.* They may be deliberately revised and slowly adjusted as the advance of technology creates new options. (Meadows, 1972, pp. 173-4)

This of course implies that there is a great need for fundamental change in the values of society. Observations related to this possibility leave some doubt concerning probability.

> "This change is perhaps already in the air, however faintly. But our tradition, education, current activities, and interests will make the transformation embattled and slow. Only real comprehension of the human condition at this turning point in history can provide sufficient motivation for people to accept the individual sacrifices and the changes in political and economic power structures required to reach an equilibrium state." (Meadows, 1972, p. 195)

The concern for looking at the environmental question as a system with interrelated components, each with many variables, is shared by others. Paul DeVore, a leader in the field of education, indicates "It is evident that the environmental question may be one of the most difficult challenges educators have faced to date." (DeVore, 1971, p. 68) He calls for a systems approach to a study of the ecosystem and the technology which has become so dominant in so many environmental questions. He calls for an environmental index which measures quantitatively the quality of the environment in a manner which receives credibility comparable to economic growth and the gross national product. This he refers to as a *Quality of Life Index* which values not only material goods but also the quality and quantity of experiences and services accessible to each person. The formula follows:

$$QL = \frac{\Sigma \text{Production} - \Sigma \text{Losses}}{\text{Population}} + \frac{\text{Services/Time}}{\text{Population}} + \frac{\text{Experiences/Time}}{\text{Population}}$$

(DeVore, 1971, p. 70)

An ecologist calling for computer assistance and systems analysis is David Archbald. He makes a constant case for the need to study the interaction between natural systems and man-created systems. The diagram provides graphic evidence of the possible relationships we have only begun to think about. (Archbald, 1972, p. 1)

Archbald further indicates that there are five basic environmental problems.

> **Doubling (exponential) rates of growth and consumption.**
>
> We have become a geological force! Our air, land and water 'disposal systems' are already overloaded. How do we curb our consumptive appetites and establish a long term man/nature equilibrium?–the first problem.
>
> **Complex systems.**
>
> . . . we are attempting to solve socioecological problems of far greater complexity and importance than man has ever faced, while key

information remains dispersed and unavailable to the decision making process.

Environmental communications and the decision making process are in acute need of updating—the second problem.

Sheer volume.

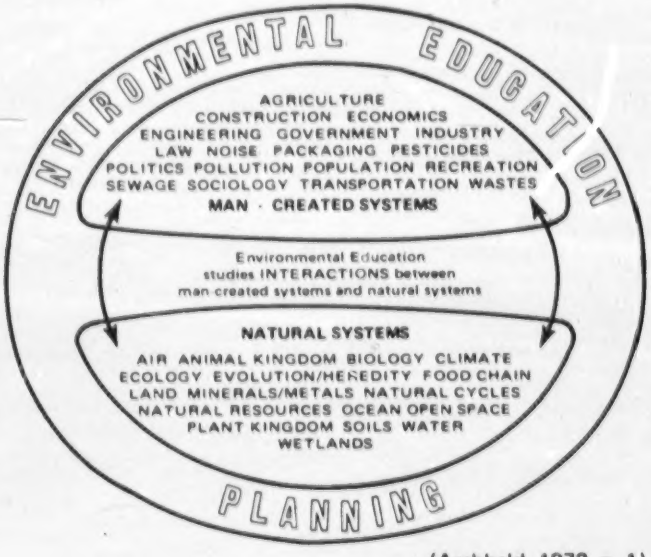
This knowledge explosion, compounded by a greatly increased environmental concern and awareness, is generating a heavy flow of environmental articles over a wide subject range throughout the point media. This sheer volume, and its dispersed nature, results in poor communication of pertinent facts to target audiences. Relevant case histories cannot be located. Significant action programs get 'buried'. The consequence—little or no information, or misinformation—the third problem.

More bridges, fewer walls.

There has been much talk about curriculum integration. But little integration has been accomplished. We need more bridges between disciplines, and fewer walls—the fourth problem.

Let George do it.

We are beginning to recognize that most of us are down wind; most of · · are down stream; that most of us have, or will have, children and grandchildren; that indeed, a common environment does embrace all of us and is, or should be, the concern of all disciplines—of all society. But what is everyone's concern tends to be no one's responsibility. It's simpler to 'Let George do it.'



(Archbald, 1972, p. 1)

> We've got to expand our horizons; to see our roles in a larger space/time context; to learn that 'helping George' helps all of us. Those who can't or won't see this are—the fifth problem. (Archbald, 1972, pp. 2-3)

The Limits to Growth, Paul DeVore, David Archbald and many others are today calling our attention to a problem of fantastic magnitude. To tamper with one variable creates often unexpected and sometimes traumatic change in one or more of the others. This tampering or patching is the way man has always sought solutions to problems. Such a procedure is no longer valid.

The environment is a fantastically complex system. Essentially all of man's activities appear to have had adverse effects on the system and only recently have any significant number of people come forward to call attention to the questionable behavior of man.

Meadows and his team applied systems dynamics and computer technology to arrive at their conclusions. Paul DeVore urges us to use a systems approach in developing an information base; in problem identification; and in probable solutions. Dave Archbald has already developed in Madison, Wisconsin, a community-oriented environmental clearing house. This system employs computer technology with prime recall capability to the many environmental categories and concepts shown in the diagram which precedes this. Obviously, our present methods for identification of information appropriate to a workable knowledge base are obsolete. Collectively and with a high degree of commitment we can begin to engage a question which is not "bandwagon" but which should evoke the attention of all.

Values, Conflicts, and Education

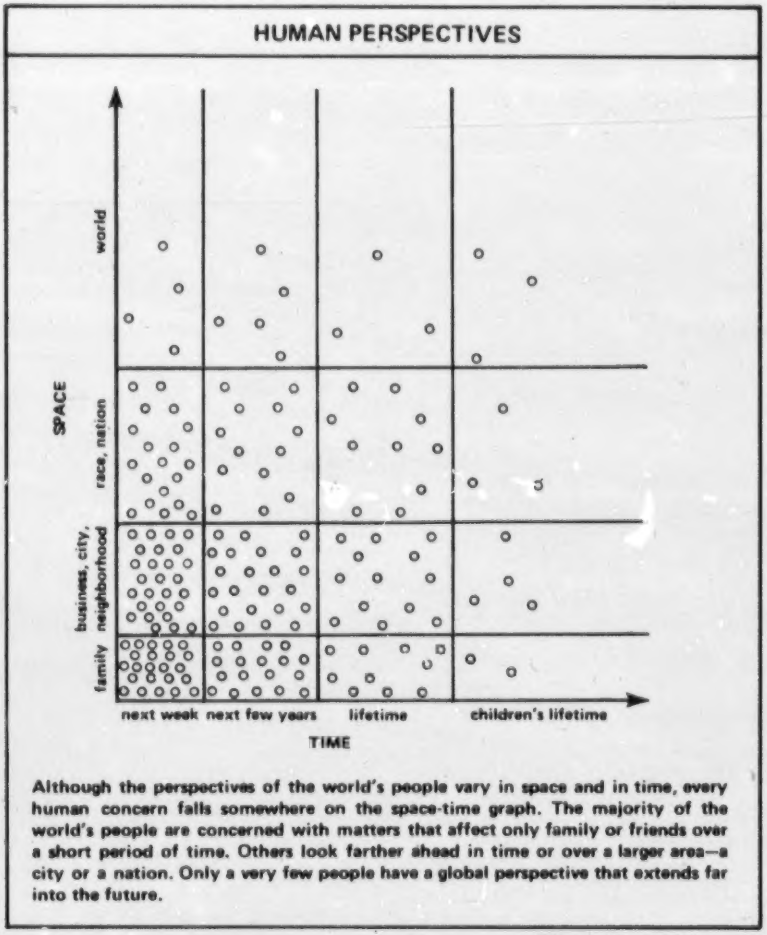
Those of us who are industrial educators or attempt to convey the concept of technology have already discovered that our background promotes our technology with only a rare question. We have grown up in a world where technological development was a never-ending goal. We are looking forward to new housing developments, skyscrapers, multi-laned highways, industrial growth and development in our communities, a bigger faster automobile, a snowmobile, a power boat, and a host of other similar technological achievements. All of this was good. Our educational programs reflect these values and also assign high priority to job preparation for the people we serve. Few could accuse us of failing to reinforce the "work ethic."

Should these values be questioned? How can we ask people with this sort of background and such firmly entrenched values to question the wisdom of some of the ultimate results of their work? Can one continue to pursue his major area of interest and also engage environmental questions and activities?

Certainly the fast pace of life today and the highly technological world we inhabit raise value questions in the minds of all intelligent beings. The degree of attention each of us assigns to these questions appears to be the point of departure from identification with old values to the adoption of new. The degree to which we subscribe, acquire, abandon, redistribute, emphasize, de-emphasize, redeploy or rescale our values is a personal thing dependent upon many variables. These values are contingent upon what we prize in ourselves and our associates, in our society, our culture, our nation, our fellowmen in general, and in our environment. Social and professional acceptability and

endorsement of our behavior is a prime factor in the ways we scale these values. Values must always be in question by the self and should be constantly examined. While our heritage is one of fixed or slowly changing values, most of which preserve the status quo, our identity with environmental questions in turn is one which suggests that a problem exists but it is not in my ball park. The parameters of our discipline have been defined and have *rarely* included any environmental concern. The assumption is that we already have more than we can comfortably cope with so why add more.

Ultimately we shall have to respond to the fundamental question of what we as educators are consciously working to achieve. Is it to prepare students



Although the perspectives of the world's people vary in space and in time, every human concern falls somewhere on the space-time graph. The majority of the world's people are concerned with matters that affect only family or friends over a short period of time. Others look farther ahead in time or over a larger area—a city or a nation. Only a very few people have a global perspective that extends far into the future.

(Meadows, 1972, p. 19)

to enter the work-a-day world? Is it to develop a sense of social responsibility? Can it be both? If we identify with the work-a-day world concept which focuses on the individual then one can comfortably identify with the current thrust to career education. If, on the other hand, we tend to believe that a great deal of emphasis should go to the development of a sense of social responsibility, our efforts will in turn favor environmental education. Both are important. Both call for interdisciplinary action. Anyone seriously concerned with technology study as an educational necessity must shortly discover that technology mandates observation and study from a multiplicity of disciplines. If our verbalized and operational goals for the youth we serve include skill development in decision making, inquiry and creativity, if we are concerned with a technologically literate personality; if we want this person to be adaptive and future oriented; if we are concerned with the concept of self and realization of potential, then DeVore has summarized these attributes in stating—"the goal is to produce an educated, action oriented populace that is knowledgeable about technology and society (DeVore, 1971, p. 70)." A dichotomy need not exist. A personal study of all facets of the question is in order. Interaction with other disciplines is requisite. A future orientation is necessary and a concern for our society must be manifested.

For most people, values are closely tied to the here and now. Our actions and behavior often reflect a fundamental concern with lasting out the day, the week or the year. This concern is usually local (my school, my college, my family) and our neighbors are largely left to cope with their own problems. Possibly a view of the graph of human perspectives will allow each of us to reflect upon the way we think, behave and act.

If one has read this far, there is hope. If there is cause to identify with the outer perimeters of the graph and a concern is deeply felt in global terms far into the future, there is greater reason for optimism. If one is now compelled to action, then let's engage the literature, the questions and the problems. No man is an island, every discipline is a resource and collectively significant contributions can be made and problems solved.

Technology and the environment are in many instances in mortal combat. Neither can win. It seems reasonable to assume that the interpreters of technology have a significant contribution to make and are morally and ethically bound to do so.

REFERENCES

Archbald, David. *Student Development of a School Environmental Information Clearing House*. Four page monograph. Impressions Inc. Madison, Wisconsin, 1972.

Baier, Kurt, and Rescher, Nicholas, Ed. *Values and the Future*. McMillan, New York, 1969.

Brown, Lester R. "An Overview of World Trends", *The Futurist*. December, 1972, pp. 225-232.

Commoner, Barry. *The Closing Circle*. Alfred A. Knopf. New York, 1972.

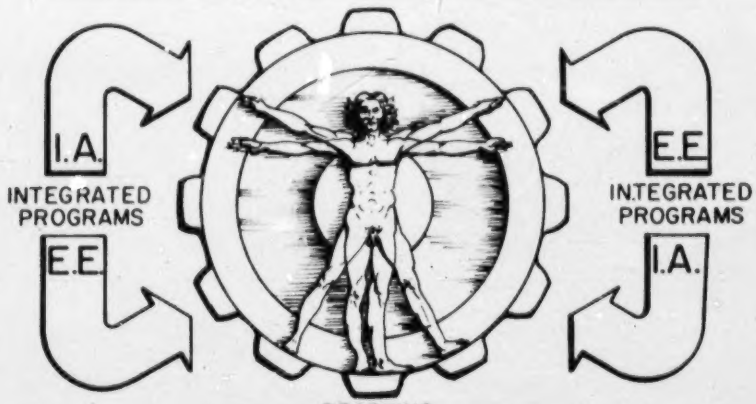
DeVore, Paul W. "How Can Industrial Education Meet the Challenge of the Environmental Crisis?" *School Shop*. April, 1971, pp. 68-70.

Fabun, Don. *The Dimensions of Change*. Glencoe Press. Beverly Hills, California, 1971.

Illich, Ivan. *Deschooling Society*. Harper and Row, New York, 1971.

Meadows, Dennis L., et al. *The Limits to Growth*. Universe Books, New York, 1972.

RATIONALE FOR INTEGRATING INDUSTRIAL ARTS AND ENVIRONMENTAL EDUCATION



REACHING
INDUSTRY AND THE CONSUMER

TO

IMPROVE THE ENVIRONMENT

CHAPTER II

INTROSPECTIVE

A Rationale for Integrating Industrial Arts and Environmental Education

by
Dr. Ray D. Loyd
California State University, Fresno, California

The popular topic of today's "informed" society is the environment. Thousands of magazine articles have been published concerning the environmental problems facing society today. Even the most patient of individuals would find a complete review of current literature on the environment an exhaustive if not almost an impossible task. These articles, although covering the same topic, are often contradictive.

Many articles written on the environment are quick to point out the "Great American Dream" as a social brainwashing performed by industry. Industry is also blamed for turning the "Dream" into a nightmare. Industry, in fact, is used as a broad term to denote the very "cause" of environmental problems. Industry and technology alone are assumed responsible for the degradation of environmental quality. As illustrated in Figure 1, assumptions

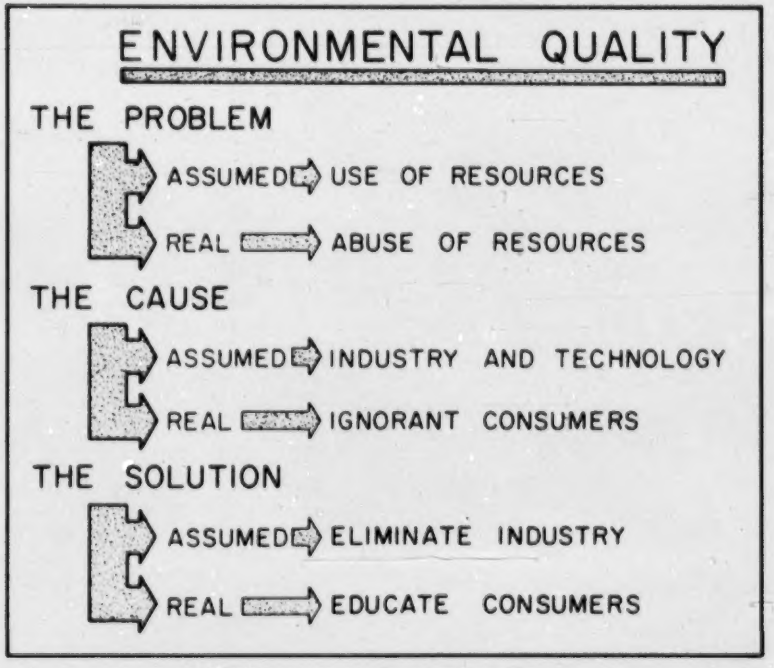


FIGURE 1: ASSUMED VERSUS REAL

are indirectly responsible for much of the confusion in relating environmental quality and industrial progress.

In a public reaction to these articles, a few people are now trying to place restrictions upon industrial progress. According to Baker, "Many people feel stringent restrictions upon industry will solve the bulk of the problems quickly"(1). A few people even advocate the complete elimination of industry and claim a return to an environment controlled by nature is the only way man can survive. Dubos discredits this claim when he points out that, "It is Man who has created the 'nature' in which we spend our daily lives"(6).

The use of our environmental resources through industrial and technological improvements is not the real problem to be concerned about. The real problem is man's abuse of environmental resources by the demands he places on industry and technology. In defense of industry and technology, Hammond declares, "Technology itself is amoral. Man makes the decisions about what he does with it and the controls he imposes over it" (9).

Industry and technology are not environmental entities separate from man and cannot be attacked as an enemy of man. Industry and technology are products of man's demand for a more comfortable environment. The attitudes and values of man's society are expressed in industry and technology. Supporting this philosophy, Hammond writes, "Every major development in technology needs to be judged by society in terms of its goals and values" (9). It is true then, industry and technology are products of man's desires, but they are not products of man's needs. They cannot be eliminated because man has needs which must be met. To simply "eliminate the 'industry' would also simply eliminate a large segment of the people—probably through violence, disease or starvation" (1).

People tend to forget their high standard of living is primarily a result of industry and technology. Bennett feels, "It is important that citizens understand their dependence on industry and their roles as direct and indirect participants in the industrial process" (4). Maley strongly states, "To be ignorant of industry and technology is to be ignorant of the major factors that influence environmental quality" (12).

Present day environmental problems exist, not because of man's intelligent use of industry and technology but because man "has all too frequently used them, through ignorance as well as stupidity, to reduce the quality of life-supporting environment" (17).

Man's abuse of environmental resources is the result of an uneducated society trying to satisfy their wants for the present with little concern for the needs for the future. Eliminating the source of environmental problems is a logical beginning in solving them. A program directed toward educating society should be developed so an understanding of industry and its relationship to the environment can be stressed. "The best place to form a framework of understanding is in the educational programming of our schools and colleges. . ." (5). The easiest approach to establishing such a program is through an existing program in industrial arts.

Industrial arts is interpretation of industry and technology through meaningful laboratory experiences. The relationships of industry to social needs, pollution, resource uses, conservation, transportation, technology, and urban

and rural planning become important factors in any interpretation of industry because of the encompassing effects of industry upon each. The study of these relationships is a reflection of environmental education.

Environmental education is defined in the Environmental Education Act of 1970 as:

> . . .the educational process dealing with man's relationship with his natural and manmade surroundings, and includes the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and rural planning to the total human environment (16).

One of the major goals of environmental education is to improve environmental quality by improving environmental awareness. Because industry is a "cause" as well as a cure for environmental problems it is a necessary part of environmental education. Being aware of industry is being aware of the environment. It should be emphasized in environmental education that industry can satisfy man's needs as well as man's wants. Yambert is quick to point out individuals must learn to distinguish between needs and wants (19).

Many environmental problems can be solved by industry because it "has at hand a powerful arsenal of research, development and design facilities" (19). Lodge believes industry has a social responsibility to establish a new

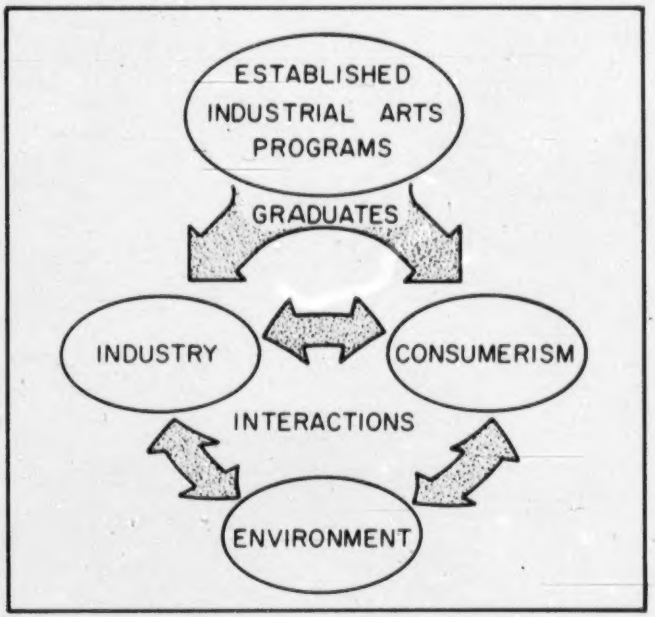


FIGURE 2: INDUSTRIAL ARTS PROGRAMS INFLUENCE INDUSTRY AND CONSUMMERISM AND THEY, IN TURN, INFLUENCE THE QUALITY OF THE ENVIRONMENT.

ideology about "the requirement of harmony between man and nature" (10).

Logan believes one of the requisites for a satisfactory environmental quality "is the emergence of a strong professional responsibility on the part of those most involved in environmental design" (11). Industrial arts reaches these people and can change their attitudes and beliefs before they enter into their profession, thus developing professional responsibility. Thus, industrial arts influences the graduate as a consumer and a professional as illustrated in Figure 2. Educators can change the goals and values of society through an integrated program of industrial arts and environmental education. With an established program of interpreting industry, industrial arts is a logical area in which to include environmental education. Industrial arts actually "deals specifically with how man utilizes resources to create a better environment and a better way of life" (4). This *is* environmental education.

Developing an environmentally literate society through industrial arts is not a new approach to environmental education. In 1969 Maley proposed "a form of industrial arts that explores the applications of technology in the solution of major social, environmental, and operational problems that face mankind" (13). Since 1969 Maley has developed a successful program integrating industrial arts and environmental education at the University of Maryland.

A special report from the United States Office of Education expressed a need to expand existing specialized programs such as industrial arts to provide innovative environmental education programs (17). Many environmentally oriented careers are developing in industry and the demand to fill new positions will be for someone with an educational background based upon environmental problems and their solution. The need for future environmental technicians further justifies environmental education in industrial arts.

Industrial arts is the best place to integrate environmental education. In discussing the possibilities of including environmental education in existing programs, Figurski wrote, "Industrial arts is inherently endowed to bring about an educational awareness of industry and technology as they relate to man and his interrelation with his environment" (8).

If industrial arts is a real study of industrial influences upon society, then environmental education must be a part of industrial arts education. Bame agrees that industrial arts can teach certain aspects of environmental education, but feels that industrial arts is not necessarily the best place for teaching environmental education (3). As indicated by Feirer, "Industrial education must be concerned about environmental education at all levels" (7). Industrial arts is the area best suited for teaching environmental education, and programs integrating the two should be developed immediately. Industrial arts teachers should be greatly concerned because, as Train aptly wrote,

> As teachers of industrial arts, you face a unique opportunity to weave environmental sensitivity into the building blocks of technology, and to let students know that without technology we have no chance of solving the most pressing environmental problems (15).

REFERENCES CITED

1. Baker, G. E., "Industrial Arts and Pollution," *Industrial Arts & Vocational Education*, Vol. 60, No. 1 (January, 1971), p. 10.
2. Baker, G. E., "Industrial Arts and Pollution," *Industrial Arts in a Changing Society*, Representative Addresses and Proceedings of the American Industrial Arts Association's 34th Annual Convention, Dallas, Texas, 1972, pp. 280-285.
3. Bame, E. Allen, "Technology and the Environment in Interface: Imperatives for Industrial Arts," *Industrial Arts in a Changing Society*, Representative Addresses and Proceedings of the American Industrial Arts Association's 34th Annual Convention, Dallas, Texas, 1972, pp. 275-278.
4. Bennett, Dean B., "Industrial Arts and Environmental Education," *Industrial Arts*, Vol. XXIX, No. 4 (Special Convention Issue, 1970), pp. 34-36.
5. Bernardo, James V., "A New Environmental Education Approach," *Man/Society/Technology*, Vol. 32, No. 4 (January, 1973), pp. 168-171.
6. Dubos, Rene, "How Man Helps Nature," *Smithsonian*, Vol. 3, No. 9 (December, 1972), pp. 18-28.
7. Feirer, John L., "MURC, Pollution and Industrial Education," *Industrial Arts & Vocational Education*, Vol. 59, No. 8 (November, 1970), p. 19.
8. Figurski, Arthur J., "Teaching About Pollution Isn't Just Hot Air," *Industrial Arts & Vocational Education*, Vol. 60, No. 7 (October 1971), pp. 22-24, 52-57.
9. Hammond, James J., "A Challenge for Man and His Environment," *Man/Society/Technology*, Vol. 32, No. 1 (September-October, 1972), pp. 23-32.
10. Lodge, George Cabot, "Top Priority: Renovating Our Ideology," *Harvard Business Review*, September-October, 1970, pp. 43-55.
11. Logan, John A., "Environmental Pollution," *Environmental Education*, Vol. 3, No. 1 (Fall 1971), pp. 49-51.
12. Maley, Donald, "The Responsibility of Industrial Arts for Interpreting Technology," *Man/Society/Technology*, Vol. 32, No. 1 (September-October, 1972), pp. 58-62.
13. Maley, Donald, "A New Role for Industrial Arts in the Senior High School," A paper presented to the National Convention of the American Vocational Association, Boston, Mass., December, 1969.
14. Marland, Jr., S. P., "Environmental Education Cannot Wait," Reprint from *American Education*, May, 1971.
15. Train, Russell E., "Toward Environmental Sensitivity," *Man/Society/Technology*, Vol. 30, No. 5 (February, 1971), pp. 138-139.
16. United States Congress, House. *Environmental Education Act*. H.R. 18260, 91st Cong., 2nd Sess., 1970.
17. United States Department of Health, Education, and Welfare, *Environmental Education - Education That Cannot Wait*. Washington, D. C.: Government Printing Office, 1970.

18. United States Department of Health, Education, and Welfare, *Environmental Health Problems*. Washington, D. C.: Government Printing Office, 1970.
19. Yambert, Paul, "Environmental Quality-Problems (Ecology, Education, and Ecompatability)," Proceeding from the Environmental Education Workshop, College of Education, Texas A&M University, College Station, Texas, June 21-25, 1971.

Rationale for Studying The Environment in Industrial Arts

by
A. Figurski, Assistant Professor
State University of New York
College at Oswego

Indictment and Challenge

Including appropriate phases of environmental education in industrial arts curriculum should be as basic as the need for safety emphasis in the school lab! However, the problems encountered when attempting to initiate environmental education or most any type of innovative program also begin with a basic premise—industrial arts, as a subject in the nation's schools, has not sufficiently accepted its responsible function of accurately interpreting industry and technology to students living in an increasingly expanding technological society. Rather, we "play at interpreting modern technology," verbalizing our well-defined goals and objectives and only occasionally or incidentally hitting the target through some activity, project, resource speaker, industrial visit or related lesson which merely scratches the surface of our potential in relating the impact of today's technology-laden environment. Is it any wonder then, since we are not doing the job in those areas already defined, that we are hesitant to accept this newcomer named environmental education?

Well, to begin, we are long overdue to get off dead center and move out into areas of promise where our subject can best accomplish its mission in the general education framework. Getting back to basics, industrial arts, if it is to interpret today's and tomorrow's technology, must find ways to include environmental education within the structure of its programs and courses. The remainder of this section will provide the reader with a widely accepted definition of environmental education and a rationale which appropriately fits industrial arts into the total school/community environmental education concept currently receiving wide support.

Definition of Environmental Education

To be sure, environmental education is not a single discipline, but rather is interdisciplinary and multidisciplinary in nature. To identify the proper role for industrial arts in environmental education, we need to examine the basic purpose and thrust of the total EE emphasis and then carefully select those parts of the total which can best be taught by our subject. The following statements, taken from the United States Office of Education's *ENVIRONMENTAL EDUCATION HANDBOOK*, provide us with this initial direction.

> The term "environmental education" means the educational process dealing with man's relationship with his natural and man-made surroundings, and includes the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment. (From the Environmental Education Act of 1970)

> Environmental education is the process that fosters greater understanding of society's environmental problems and also the processes of environmental problem-solving and decision-making. This is accomplished by teaching the ecological relationships and principles that underlie these problems and showing the nature of the possible alternative approaches and solutions.
>
> That is, the process of environmental education helps the learner perceive and understand environmental principles and problems, and enables him to identify and evaluate the possible alternative solutions to these problems and assess their benefits and risks. It involves the development of skills and insights needed to understand the structure, requirements, and impact of interactions within and among various environmental entities, subsystems, and systems. . .

The definition above reveals that environmental education is not a single discipline, but rather is interdisciplinary and multidisciplinary. This characteristic is essential, for in order to accomplish its unique goals, environmental education must utilize at least four broad areas: the total environment and its problems; ecological principles, relationships, and concepts; the entire educational system (both formal and nonformal sectors); and most of the traditional disciplines, from chemistry, physics, and biology to sociology, economics, psychology, and the arts. Each environmental education activity partakes of particular aspects of these areas, fusing them in a manner that makes a greater comprehension and understanding of contemporary environmental issues and problems possible by bringing about deeper awareness of relevant interrelationships and, where appropriate, the nature of possible alternatives to existing environmental situations.

> In other words, environmental education deals with problems that we need to understand but that we cannot fully understand through the approach of any single traditional discipline. Consequently, we need the resources of many of them acting in concert. (ENVIRONMENTAL EDUCATION HANDBOOK)

The resources of industrial arts and all that contribute to our subject enable it best to assume the role of dealing with the technological dimensions of environmental education. This is now the current challenge for the industrial arts profession—to decide how it can make viable contributions in environmental education and then proceed with well-defined programs of action.

Rationale for EE in Industrial Arts

In order to arrive at a rationale for our inclusion in ranks of environmental educationists, we need only examine the previously discussed definitions of EE, what the current problems of the environment are, and what we say industrial arts, by definition, should be. We cannot interpret industry and technology to youth if our programs do not include a study of the positive and negative results of *industrial organization, operation, and occupations, as they relate to technology's influence on the environment.* Pollution, for

instance, is the unwanted by-product of man's interaction with technology. It is definitely related to the ways *production and services industries* have organized. Pollution is a problem of today's industries that is being weighed against the benefits of high-level production and concurrent affluence. It is ultimately caused by the *technological mix of the plans, materials, tools, and processes in the absence of sufficient pollution abatement equipment*. Concurrently, however, it is the application of technology that is attacking and solving environmental problems. Occupationally speaking, people through their jobs produce pollution. However, on the other side of the coin, hundreds of *industrial occupations* deal specifically with process engineering, in-plant health and safety, and numerous environmental technician-type jobs that are devoted to pollution control. Environmentally-oriented occupations are growing increasingly. If you take the key words (*italics*) in this paragraph and arrange them in order sequence prefixed by "Industrial arts is . . ." you arrive at our environmental mission via our purported definition. Let's face it now! What we have historically talked about "becoming" we now have an opportunity to become. It has often been said that the key to success is being around at the right time under the right set of circumstances. The call for us is to dislodge from our rhetoric and move to the dynamic reality of bringing our industrial arts definition to life. Now is the time and the right set of circumstances are obvious. Industrial arts is inherently endowed to bring about an educational awareness of industry and technology as they relate to man and his interrelation with his environment. Congressman John Brademas, author of the Environmental Education Act in the House, sees the role of industrial arts in environmental education as follows:

> The industrial arts, of course, is the discipline which has traditionally addressed man's relationship to the things he makes and uses, so it seems natural that men and women in the field should be leaders in the creation of some of these new educational forms. Both in creating new curricula for the classroom and in going out from the school to the community, people in industrial arts have an orientation to the real world which will make them invaluable in creating education for a new environment.

The following section of this monograph will identify some of the educational forms being used by industrial arts teachers and teacher educators which are exemplary of environmental education in industrial arts.

FUNDING AND CAREERS

by
C.E. Strandberg
Eastern Illinois University

Available Funding for Education

The Environmental Education Act was signed and became functional late in 1970. The act grew from recognition that the state of our environment had become a matter of serious concern and those attempts to solve the crises must be deeply rooted in the educational system and within the covert consciousness of America's people. Man's very survival depends upon an understanding of his relationship to the environment and the subsequent relationships of all living things.

The act defines environmental education as the process of dealing with man's relationship with his natural and man-made surroundings, including the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment. The educational activity envisioned by the act is problem-solving, issue-centered learning. It pertains to all forms and levels of life, and especially man's interrelationships with his environment. It provides learning experiences that prepare students for life situations.

Funds appropriated by the Environmental Education Act support the development of curricula to preserve and enhance the environmental quality and ecological balance; support environmental education programs at the elementary and secondary levels: disseminate information relating to environmental curricula; support preservice and inservice education programs and projects, including fellowship programs, institutes, workshops, symposiums, and seminars; plan outdoor ecological study centers; provide community education programs on environmental quality; and the preparation and distribution of materials for use by the mass media relating to the environment and ecology.

In addition to funds, the Secretary of Health, Education, and Welfare provides technical assistance to local educational agencies, organizations, institutions of higher education, local and state agencies, and other agencies assuming a role in preserving and enhancing the environmental and ecological balance. Small grants not exceeding ten thousand dollars are available to selected groups to conduct workshops, courses, seminars, symposiums, institutes, and conferences, especially for community and adult groups.

The U.S. Department of Health, Education, and Welfare's Office of Environmental Education has made available a Handbook on Preparing Proposals relating to the Environmental Education Act of 1970. The second section of the handbook describes the three types of grants available and the criteria for each grant. Small grants are awarded to non-profit organizations and do not exceed ten thousand dollars annually. Statewide dissemination and evaluation grants serve the constituencies of education, conservation, health, labor, industry, consumer organizations, and other appropriate groups. Pilot projects and demonstration models provide funds for personnel education, both

preservice and inservice; and for community awareness through schools, environmental education centers; and citizen participation projects. This type also provides for instruction and curriculum development, and for evaluation procedures.

The third section of the handbook outlines the technical requirements and general criteria for participation in the environmental education act. Section Four, Suggestions and Definitions, is directed toward establishing guidelines for project effectiveness, eligibility, and control. The fifth section establishes guidelines for preparing and submitting proposals, including budgeting. The last section lists grant terms and conditions.

The Office of Environmental Education is located at 400 Maryland Avenue, S.W., Code 424, Washington, D.C. 20202. The telephone is area 202, number 755-7682 or 755-7685. Interested persons or groups should request the Environmental Education Handbook (Public Law 91-516).

The U.S. Environmental Protection Agency provides grant assistance for Research and Development, Demonstration, Manpower Development and Training, and State and Local Assistance environmental programs. A handbook publication describes the statutory authority, purpose, fund limitations, contact point for information and assistance, and eligibility for federal funds of each grant program. The Grant Assistance Programs Handbook is available from the Environmental Protection Agency, Office of Administration, Grants Administration Division, Washington, D.C. 20460.

Research and Development assistance includes air pollution control, pesticides, radiation, solid waste, and water pollution control. These programs provide funds to research and develop new means of pollution standards in these areas.

Demonstration grants provide support for the coordination of research, development, and demonstration projects relating to the causes, control, and prevention of water and air pollution and solid wastes. These grants assist in developing new techniques or refining existing practices in pollution control methods.

Manpower Development and Training grants assist public and other nonprofit institutions in establishing, expanding, or improving educational opportunities for individuals interested in a career in air and water pollution control, radiation disposal, and solid waste accommodation. Long term education assistance is usually provided through universities, while short term programs are provided for state administration.

Air and water pollution control fellowships are provided to increase the number and competence of professional personnel engaged in research and administration activities in the prevention and abatement of air and water pollution. These grants support specialized education of individuals.

Careers in the Environmental Sciences and Industry

The environmental sciences explore the composition and characteristics of the earth's land, water, interior, atmosphere, and in deep space. The continuing development and growth of modern American industry is dependent upon the maintenance and replenishment of these resources. These five basic areas of environmental attention are directly related to industrial activity.

The structure, composition, and history of the earth's crust is important to the construction, manufacturing, transportation, agri-business, natural resources, health, public services, and environmental control clusters. The minerals and ores, fabricating materials, and liquids of the earth's surface are essential to modern American industry. The earth's crust and interior share common materials and interests with these clusters.

Water pollution control is an area of paramount interest and importance to industry. Extraction and manufacturing industries have traditionally misused water beds and waterways in the processes of their production. One of the two most critical areas of earth pollution—the other being the atmosphere—in today's industrial activity is the preservation and enhancement of the water supply.

Atmospheric pollution requires stringent controls during all phases of industrial production, transportation, marketing, and consumption. Emission control equipment is mandatory for nearly all types of industrial manufacturing processes. Atmospheric pollution is further compounded by secondary pollutants released during the consumption of chemically processed commodities such as gasoline, gases, and other combustibles.

Debris pollution of deep space, albeit a seemingly minor problem at present, is permanent because of the relative permanency of objects abandoned in space. The absence of atmospheric and mineral deterioration influences prolongs the life of debris to almost infinity.

Careers in environmental education and control depend upon a basic grasp of the environmental sciences of geology, geophysics, meteorology, and oceanography. The industrial sciences, such as production control, motion and time study, quality assurance, and related fields, are directed toward maintaining preascertained positions of environmental quality. The common thread both areas share is based upon the natural sciences and mathematics, with an understanding of the behavioral sciences as an adjunct to administering a quality program of environmental education.

The technologies of industry are closely related to the sciences of nature and man. The abstractness of one is balanced and enhanced by the pragmatism of the other. Industrial arts education has long enjoyed the uniqueness of its ability to combine both of these assets.

BIBLIOGRAPHY

by
Iver H. Johnson
Mankato State College

Arnov, Boris. *Homes Beneath The Sea*. Little, 1969.

Ayers, Eugene, and Charles A. Scarlott. *Energy Sources: The Wealth of the World*. New York: McGraw-Hill, 1952.

Ayres, Robert U. *Technological Forecasting and Long-Range Planning*. New York: McGraw-Hill Book Company, Inc., 1969.

Baier, Kurt, and Nicholas Rescher. *Values and the Future: The Impact of Technological Change on American Values*. New York: Free Press.

Bell, Daniel, ed. *Towards the Year 2000: Work in Progress*. Beacon Press.

Berland, Theodore. *The Fight For Quiet*. Prentice-Hall, 1970.

Bernard, Melvin A. *Our Precarious Habitat*. Norton, 1970.

Bollens, John C., and Schmandt. *The Metropolis*. New York: Harper and Row, 1965.

Bonner, James, Harrison Brown, and John Weir. *The Next Hundred Years*. Viking, 1957.

Brooks, Paul. *The Pursuit of Wilderness*. Houghton, 1971.

Brown, Harrison. *The Challenge of Man's Future*. Viking Press.

Brown, Lester R. *Seeds of Change: The Green Revolution and Development in the 1970's*. Praeger, 1970.

Cahill, Susan, & Cooper, Michele F., comps. *The Urban Reader*. Prentice-Hall, 1971.

Calder, Nigel. *Technopolis, Social Control of the Uses of Science*. Simon and Schuster, New York, 1970.

Callahan, Daniel J., ed. *The American Population Debate*. Doubleday, 1971.

Chase, Stuart. *The Most Probable World*. New York: Harper and Row, 1968.

Chedd, Graham. *Sound: From Communication to Noise Pollution*. Doubleday, 1970.

Cole, Dandridge. *Beyond Tomorrow: The Next 50 Years in Space*. Amherst, 1965.

Commoner, Barry. *The Closing Circle, Nature, Man and Technology*. New York: Alfred A. Knopf, 1972.

Cotton, Steve, ed. *Earth Day—The Beginning*. Bantam, 1970.

Cox, Harvey. *The Secular City*. New York: The Macmillan Co., 1966.

Davies, J. Clarence. *The Politics of Pollution*. Pegasus, 1970.

De Bell, Garrett. *The Voter's Guide to Environmental Politics Before, During and After the Election*. Ballantine Books. 1970.

Eco-Catastrophe, by the editors of Ramparts. Harper, 1970.

Ehrlich, Paul R., and Ehrlich, Anne H. *Population Resources and Environment*. San Francisco: W. H. Freeman and Company, 1972.

Ehrlich, Paul R. *The Population Bomb*. New York: Ballantine Books, 1968.

Eldredge, H. Wentworth, ed. *Taming Megalopolis*. 2 Vols.

Edwald, William R., Jr., ed. *Environment and Policy: The Next Fifty Years*, and *Environment and Change: The Next Fifty Years*. 2 Vols, Indiana University, 1968.

Friedmann, Wolfgang. *The Future of the Oceans*. New York: George Braziller, 1971.

Fuller, Buckminster R. *World Design Science Decade*. Six documents, Southern Illinois University.

Galtung, Johan, and Robert Jungk. *Mankind 2000*. Oslo: Universitetsforlaget, 1968.

Gay, Kathlyn. *Where the People Are: Cities and Their Future*. Delacorte, 1969.

Gofman, John W., and Tamplin, Arthur R. *Poisoned Power: The Case Against Nuclear Power Plants*. Emmaus, Pennsylvania: Rodale Press, Inc., 1971.

Gruen, Victor. *The Heart of Our Cities*. New York: Simon & Schuster, 1964.

Halacy, Daniel S. *Habitat*. Macrae Smith, 1970.

Hatt, Paul K., ed. *World Population and Future Resources*. New York: American Books, 1952.

Hauser, Philip M. *The Population Dilemma*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963.

Hellman, Hal. *Biology in the World of the Future*. New York: M. Evans, 1971.

Hellman, Harold. *The City in the World of the Future*. Evans, distributed by Lippincott, 1970.

Higbee, Edward C. *A Question of Priorities: New Strategies for our Urbanized World*. Morrow, 1970.

Hubbard, Earl. *The Search is On: A View of Man's Future from the New Perspective of Space*. Pace, 1969.

Hyde, Margaret O. *For Pollution Fighters Only*. McGraw-Hill, 1971.

Johnson, Warren A., and Hardesty, John, ed. *Economic Growth vs. the Environment*. Belmont, California: Wadsworth Publishing Co., 1971.

Lauwerys, J. A. *Man's Impact on Nature*. Pub. for American Museum of Natural History by Natural History Press, 1970.

Laycock, George. *The Diligent Destroyers*. Doubleday, 1970.

Leavitt, Helen. *Superhighway-Superhoax*. Doubleday, 1970.

Loftas, Tony. *The Last Resource*. Regnery, 1970.

Mannix, Daniel P. *Troubled Waters*. Dutton, 1969.

Marsak, Leonard M. *The Rise of Science in Relation to Society*. New York: The Macmillan Co., 1964.

McClung, Robert M. *Lost Wild America*. Morrow, 1969.

McHale, John. *The Ecological Context*. New York: George Braziller.

McKeown, Tietze. *The Changing Metropolis*. Boston: Houghton-Mifflin Publishers.

Meadows, Donella H. *et al. The Limits To Growth*. New York: Universe Books, 1972.

Meek, Roy L. and John A. Straayer, ed. *The Politics of Neglect: The Environmental Crisis*. Boston: Houghton-Mifflin, 1971.

Meyerson, Martin, ed. *The Conscience of the City*. Braziller, 1970.

Michael, Donald. *The Unprepared Society: Planning for a Precarious Future*. New York: Basic Books, 1968.

Millard, Reed, and Editors of Science Book Associates. *How Will We Meet the Energy Crisis?* Messner, 1971.

Nam, Charles B. *Population and Society*. New York: Houghton-Mifflin Publishers, 1968.

Olsen, Jack. *Slaughter the Animals, Poison the Earth*. Simon & Schuster, 1971.

Pringle, Laurence. *One Earth, Many People*. Macmillan, 1971.

Rosenfield, Albert. *The Second Genesis: The Coming Control of Life*. Prentice-Hall, Inc., 1969.

Ruzic, Neil P. *Where the Winds Sleep: Man's Future on the Moon*. Garden City: Doubleday, 1970.

Scott, John. *Hunger*. Parents Magazine Press, 1970.

Smith, Guy-Harold. *Conservation of Natural Resources*. Wiley, 1971.

Steele and Kircher. *The Crisis We Face*. New York: McGraw-Hill, 1960.

Stevens, Leonard A. *The Town That Launders Its Water*. Coward-McCann, 1971.

Swatek, Paul. *The User's Guide to the Protection of the Environment*. Ballantine, 1970.

Taylor, Gordon R. *The Biological Time Bomb*. New York: World Publishers, 1968.

Taylor, Gordon R. *The Doomsday Book: Can the World Survive*. New York: World Publishers, 1970.

Toward Balanced Growth: Quantity with Quality. U.S. Government Printing Office, 1970.

Turk, Amos, *et al. Ecology, Pollution, Environment*. Philadelphia: W. B. Saunders Company, 1972.

Von Eckardt, Wolf. *The Challenge of the Megalopolis*. New York: 20th Century Fund, 1964.

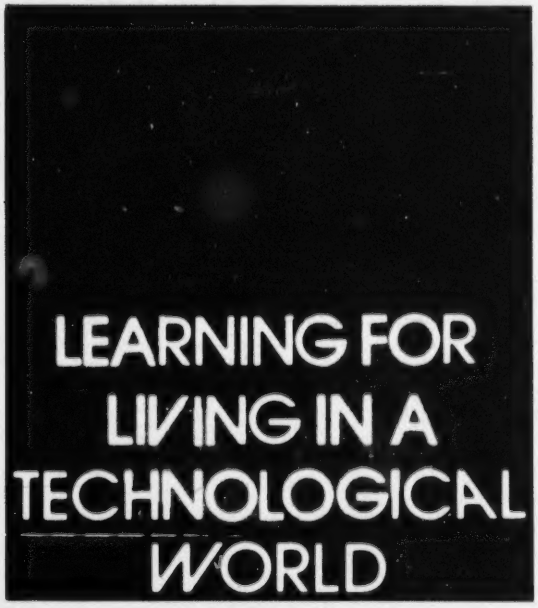
Wagner, Richard H. *Environment and Man*. New York: W. W. Norton and Co., Inc., 1971.

Wall Street Journal. *Here Comes Tomorrow: Living and Working in the Year 2000*. New York: Dow Jones, 1966.

Woytinsky, W. S., and E. S. Woytinsky. *World Population and Production*. New York: Twentieth Century, 1953.

Wrong, Dennis H. *Population and Society*. New York: Random House, 1967.

Zwick, David, and Marcy Benstock. *Water Wasteland*. Grossman, 1971.



Here is a film which portrays the history of technology and goes on to plan for the future. What is the place of industrial arts in the world of today and tomorrow? How can industrial arts educators help to design a future world fit for human habitation?

Learning for Living in a Technological World: 16mm, color, sound, 14 min; available for sale or rental from AIAA, 1201 16th St., N.W., Washington, D.C. 20036.

ENVIRONMENTAL EDUCATION

COMMITTEE MEMBERS

CHAIRMAN. . . . . Dr. Donald P. Lauda
Indiana State University
Terre Haute, Indiana

REGION I. . . . . Dr. Ray D. Loyd
California State University
Fresno, California

Mr. Louie Melo
California State University
San Jose, California

REGION II. . . . . Dr. Eugene Balzer
Northern Arizona University
Flagstaff, Arizona

REGION III. . . . . Mr. Iver Johnson
Mankato State College
Mankato, Minnesota

REGION IV. . . . . Dr. Daniel Householder
Purdue University
Lafayette, Indiana

Dr. C. E. Strandberg
Eastern Illinois University
Charleston, Illinois

REGION V. . . . . Mr. Lawton P. Bourn, Jr.
Rhode Island College
Providence, Rhode Island

REGION VI. . . . . Mr. Arthur Figurski
State University College
Oswego, New York

REGION VII. . . . . Dr. E. Allen Bame
North Carolina State University
Raleigh, North Carolina

BEST COPY AVAILABLE

POSITION STATEMENT
AMERICAN INDUSTRIAL ARTS ASSOCIATION

The American Industrial Arts Association supports the contemporary movement directed toward the maintenance and improvement of the quality of the total human environment. Industrial arts should make significant contributions to the ecological awareness of students at all educational levels.

Producers and consumers alike have a vital stake in the environment of the future. Industrial arts must play a central role in multi-disciplinary environmental education. It is not sufficient, however, simply to make students aware of the environmental implications of the materials utilization and processing activities of the contemporary industry. The program must help all learners attain a fulfilling life style within the constraints of environmental preservation. The Association stands ready to assist teachers as they seek to implement environmental education activities.

THE ENVIRONMENTAL EDUCATION COMMITTEE
OF THE
AMERICAN INDUSTRIAL ARTS ASSOCIATION